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Patents Form 1/77

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Request for grant of a patent

1.	Your Reference	**HSS/AJP/Y1021**
2.	Application number	**0311246.3**
3.	Full name, address and postcode of the or each Applicant Country/state of incorporation (if applicable)	**Easypack Limited** **Unit 4** **Mundells Industrial Centre** **Little Mundells** **WELWYN GARDEN CITY** **Hertfordshire** **AL7 1EW** **Incorporated in: United Kingdom**
4.	Title of the invention	**Manufacture of Air Bags**
5.	Name of agent Address for service in the UK to which all correspondence should be sent Patents ADP number	**APPLEYARD LEES** **15 CLARE ROAD** **HALIFAX** **HX1 2HY** **190001** ✓

7855307002

6. Priority claimed to:

Country	Application number	Date of filing
United Kingdom	**03 00747.3**	**14 Jan 2003**

7. Divisional status claimed from:

Number of parent application	Date of filing
-	-

8. Is a statement of inventorship and of right to grant a patent required in support of this application? **YES**

9. Enter the number of sheets for any of the following items you are filing with this form. Do not count copies of the same document	
Continuation sheets of this form	
Description	2 x 19
Claim(s)	8
Abstract	
Drawing(s)	~~2 x~~ 3 ~~x~~ 3
10. If you are also filing any of the following, state how many against each item	
Priority documents	
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Statement of inventorship and right to grant a patent (PF 7/77)	
Request for a preliminary examination and search (PF 9/77)	
Request for substantive examination (PF 10/77)	
Any other documents (please specify)	
11.	We request the grant of a patent on the basis of this application. Signature Date **APPLEYARD LEES** **15 May 2003**
12. Contact	**Hugh Sherrard-Smith- 01422 330110**

Manufacture of Air Bags

The present invention relates to air bag manufacturing apparatus, a method of manufacturing air bags and a cartridge arranged, in use, to be made into air bags.

In a known machine for forming plastics bags with air in them such as described in our co-pending European application 02 251 571.2 published under number 1 245 491, the contents of which are hereby incorporated, a nozzle pierces and injects air into a tube of film. Whilst this provides very satisfactory bags there are some drawbacks. In particular, the penetration of the nozzle into the tube requires a considerable amount of machinery which is expensive to supply and requires regular maintenance. Furthermore, the length of each bag is not readily adjustable.

Other methods of forming air bags comprise having a sheet of plastics folded about its length to present a fold at one side and open edges at the other. The sheet is pre welded across its length at spaced locations that correspond to the length of the bag. Air is blown in from the side and the side is subsequently sealed to form the bag. This film is expensive. Furthermore, the sides of the bag do not always open satisfactorily thus producing bags with inconsistent air fillings. In addition, the length of each bag is predetermined by the partly pre-sealed film.

It is an object of the present invention to attempt to overcome at least one of the above or other disadvantages.

According to one aspect of the present invention air bag manufacturing apparatus comprises a tube of film arranged to be fed to a sealing station which station, in use, is arranged to apply seals across the width of a tube to trap air in the tube between two spaced seals, the apparatus being characterised in that air is supplied to be trapped between two spaced seals through the tube, from an open end of the tube.

The tube may be supplied to the sealing station from a supply station with the supply station being arranged to maintain a passage through the tube. The supply station may include a hollow member such as a tubular member around which the tube is located. The air that is arranged to be trapped between two spaced seals may be arranged to pass through the interior of the hollow member.

The tube of film may be arranged to be bunched up, such as by being bunched up in the axial extent of the tube. Prior to any air bags being made from the tube, that bunching up may comprise the ratio of the length of bunched up tube to the length of the tube when stretched out being more than 1:2 or more than 1:10 or in the region of 1:100 or more than 1:100 or in the region of 1:200 or more than 1:200 or in the region of 1:300 or more than 1:300.

The supply station may be removably mounted on the apparatus. A different supply station can be used when a previous supply station is no longer required, for instance because the previous supply station is empty.

During mounting of the supply station, the supply station may be arranged to partially engage with the apparatus and move in at least one axial direction with respect to the elongate axis of the tube and preferably in two axial directions when so engaged, either or both of which axial directions of movement may be against a resilient bias or with a resilient bias with for instance, movement in one axial direction being against the resilient bias and movement in the other axial direction being with the resilient bias. The resilient bias may comprise a spring such as a compression spring.

The supply station may be arranged to be held in position by the apparatus when mounted thereon to prevent further movement of the supply station towards the sealing station. The supply station may be arranged to be at least partially supported at at least one end, for instance the end furthest away from the sealing station, by, for instance, a support member of the apparatus extending within the supply station, which may also extend along the supply station. Alternatively or additionally, the supply station may be arranged to be at least partially supported at one end, preferably the end nearest the sealing station, by a brush or an upper and lower brush.

The supply station may comprise an end stop for at least one end, and preferably both ends, which end stops are arranged to resist the passage of film over one or each stop without assistance. The or each end stop may comprise a flange such as a circular flange extending radially outwardly with respect to the longitudinal axis of the tube at that end.

The tube of film may be arranged to pass over a spreader having a greater extent in the direction across the tube in the direction that a seal made by the sealing station is arranged to make than in a direction transverse thereto. The spreader may be hollow and may be arranged to have air passed through the spreader which air is the air that is arranged to be trapped between two spaced seals.

The spreader may be located downstream of the supply station. The spreader may be fast with the supply station. The spreader may be detachably mounted on the supply station such as by means of a force fit or a bayonet fit with the supply station.

The apparatus may include drive means arranged to supply film to the sealing station.

The apparatus may be arranged to impart a differential force on a tube upstream of the sealing station which is arranged to urge axially spaced portions of the tube apart from each other. The differential force may be arranged to be applied by a pair of members which may be spaced from each other. The downstream one of these pair of members may be arranged to drive the tube, for instance from opposed sides of the tube. The upstream member may also be arranged to exert a drive to the film with the speed of drive imparted to the tube by the upstream drive member being less than the speed of drive imparted by the downstream member. Slippage of the film may be arranged to occur between the upstream member and the downstream

member. When either or both of the members are driven they may comprise rollers.

The sealing station may be arranged to effect a seal when the tube is stationary or when the tube is moving.

The sealing station may be manually actuatable or automatically actuatable or both. The sealing station may be arranged to form a pair of adjacent seals during each sealing operation. The sealing station may be arranged to effect a weakening of the tube between adjacent seals when effecting a sealing operation, for instance by exerting a series of perforations across the tube when effecting the seal.

In use, bags may be arranged to be pulled at a location downstream of the sealing station, for instance by being pulled manually or automatically for instance by a pair of rollers.

The frequency of the operation of the sealing station may be adjustable or, alternatively or additionally, the rate of feed of the tube past the sealing station may be adjustable.

The air that is arranged to be trapped between two spaced sides of the tube may be supplied by a fan.

According to another aspect of the present invention a method of forming bags containing air comprises supplying air to a tube from one end of the tube, through the tube, and past a sealing station and effecting a seal across the tube by the sealing station.

The method may comprise drawing film off a bunched up supply of film and moving that film to the sealing station.

The method may comprise replacing a supply of film with a different supply of film, for instance when the previous supply of film is empty or is no longer required.

The method may comprise causing the film to pass over a spreader having a greater extent in the direction across the tube in the direction that a seal is made than in a direction transverse thereto. The method may comprise passing the film over the spreader when loading the machine with film or causing the film to repeatedly be drawn over the spreader during manufacture of the bags. The method may comprise passing air through the spreader with the air subsequently being trapped between two spaced seals.

The method may comprise attaching the spreader to a supply station prior to making the bags.

The method may comprise straightening the length of film at a location downstream from where the film is bunched up, for instance by exerting a tension force on the film.

The method may comprise manually actuating the sealing station to cause a seal to be made or automatically actuating the sealing station to cause a seal to be made or both.

The method may comprise supporting the supply of film by a member that resists both a downwards and a moment force caused by the weight of the supply of the tube.

The method may comprise pulling bags off the machine from a location downstream of the sealing station. Alternatively or additionally, the method may comprise the air being supplied through the tube urging the film past the supply station which air may comprise the sole force urging the tube forwards.

The method may comprise varying the frequency of operation of the sealing station or varying the speed of supply of the film or both. The method may comprise automatically making bags of a first length from the supply of films and then adjusting the machine to make bags of a different length or to make bags having a different content of air or any combination thereof.

The method may comprise varying the amount of air in a given length of bag, for instance by varying the direction that the tube leaves the sealing station or restricting the expansion of the walls of the tube downstream of the sealing station such as manually making that restriction or any combination thereof.

The method may comprise a packer making a bag of a first length having a first volume of air, making a bag of a first length having a second volume of air, making a bag of a second length having a third volume of air which third volume may be the same as the first or second volumes or any combination thereof.

The method may comprise supplying air through the tube from a fan.

The present invention also includes a method of making bags when using apparatus as herein referred to.

According to a further aspect of the present invention a film cartridge arranged, in use, to be made into air bags, comprises an elongate carrier with a tube of film thereon, the tube being bunched up on the cartridge along its elongate axis such that the length of the bunched up film is less than the length of the extended film, the cartridge including an airway through the length of the tube through which, in use, air is arranged to pass in order to comprise air in the air bags from the tube of film.

The degree of bunching of the film may be such that the ratio of the bunched length of the tube to the fully extended length of the tube may be greater than 1:2 or greater than 1:10 or in the region of 1:100 or more than 1:100 or in the region of 1:200 or more than 1:200 or in the region of 1:300 or more than 1:300.

The carrier may include a stop at at least one end arranged to inhibit the passage of the tube off that end. The stop may be integral with the carrier. The stop may comprise a disc.

The carrier may comprise a hollow member such as a tubular member. The hollow member and the machine may cooperate with each other by means of a projection and recess with the cartridge being supported thereby on the machine. The

hollow member may be arranged, in use, to receive a projection from a machine which may be arranged to at least partially extend into the cartridge and may extend along the cartridge. The projection may be arranged to restrict a bending moment exerted by the weight of the cartridge about the end region of the cartridge.

The cartridge may include an adaptor at one end. The adaptor may be arranged to be detachably mounted on the cartridge, for instance by a friction fit or by a bayonet fit. The adaptor may be hollow. The adaptor may include an outlet facing away from the cartridge having a greater extent in one direction, transverse to the longitudinal axis of the tube than an extent that is transverse to that direction which is also transverse to the elongate extent of the tube.

According to a further aspect of the present invention, a method of loading a supply of hollow film onto a cartridge comprises causing relative movement of the cartridge and the hollow film such that part of the film surrounds the cartridge and then causing the film to be reduced in its elongate length to cause more film to surround the cartridge.

The method may comprise loading hollow film having a greater internal cross-sectional area than the exterior cross-section of the cartridge.

The method may comprise loading film onto a cartridge with the length of film that is so loaded being more than 10 or more than 20 or more than 50 or in the region of or more than 100 times the length of the cartridge.

The method may comprise locating the open end of the hollow film onto the cartridge, for instance during the initial loading of the film. The method may comprise driving the film onto the cartridge such as by a friction drive or, alternatively or additionally by a rotating member urging the film against the cartridge and along the cartridge which member may rotate about an axis transverse to or perpendicular to the elongate axis of the film.

The method may comprise driving the film onto the cartridge. The drive may comprise a first drive causing film to move in a first direction along the cartridge and a second drive that moves the location at which the first drive acts in a second direction, opposed to the first direction. The first and second drives may act at the same time. The first drive may comprise rotating at least a first member, and preferably two opposed members which may be on opposed sides of the cartridge.

The present invention also includes a cartridge which has been loaded by the method herein referred to.

According to another aspect of the present invention, a packing cartridge comprises a cartridge having a supply of hollow film bunched up along the elongate axis of the film located thereon, the film being of greater length than the cartridge when the film is not bunched up along the elongate axis of the film.

The film may be of greater cross-sectional area or circumference than the cross-sectional area or circumference of the cartridge.

The present invention also includes a cartridge when used in air bag manufacturing apparatus as herein referred to or when used in a method of manufacturing air bags as herein referred to.

The present invention includes any combination of the herein referred to features or limitations.

The present invention can be carried into practice in various ways but several embodiments will now be described, by way of example, and with reference to the accompanying drawings in which:-

Figure 1 is a perspective view of a film cartridge 10;

Figure 2 is a perspective view of the cartridge 10 in association with drive rollers;

Figure 3 is a schematic side view of the bag forming machine, and

Figure 4 is a perspective view showing a line of bags 12.

The cartridge 10 comprises a hollow cylinder 14 having enlarged end discs at either end. A tube of plastics film 18 is concertined or bunched up on the cylinder 14 with the film being retained on the cartridge by the end discs 16. With a full cartridge of 1m in length, 200m of film may be concertined on the cartridge.

The cartridge is loaded onto the machine by the disc 16 at the rearward end of the cartridge pushing a washer 20 against the reaction of a spring 22 to the right, when

viewed in Figure 3. The washer is mounted on a tube 24 over which the interior of the end of the cylinder 14 slides. With the washer 20 pushed back to be adjacent to a fixed back plate 26 the forward disc 16 can be moved past the end 28 of an adaptor 30 until the round end of the adaptor is aligned with the forward end of the cylinder 14. The force exerted by the spring 22 then urges the cylinder over the round end of the adapter. Forwards movement of the cartridge is restricted by abutment of an internal flange 32 of the cylinder, axially spaced from the end of the cartridge, with the axially facing end 28 of the adaptor.

The washer 20 is retained on the tube 24, when no cartridge is present, by engaging a small outwardly extending rim 34 at the end of the tube.

Removal of a cartridge is a reversal of the above described sequences. Loading and/or unloading may be effected automatically.

Any suitable alternative means of attaching or detaching the cartridge may be provided. For instance, the forward end of the cartridge could be slid over the end of the adaptor, which may be a force fit or bayonet fit, with the rear end being dropped into or clicked into or retained in a suitable formation.

When a cartridge is in position, the forward end of the film is gathered and pulled over the disc 16, to the right when viewed in Figure 3. The film is passed over the adaptor, past a first pair of rollers 36 and then a second pair of rollers 38. The rollers 36 or 38 or both could be

lifted clear, either at the top or bottom or both to assist in passing the film over the adaptor. Alternatively or additionally at least one roller in one pair or at least one roller from each pair could be driven to assist in the passing of the film over the adaptor.

The film then passes over a work surface 40 and past a sealing station 42. If desired, drive means could be provided downstream of the sealing station to assist in the passage of the film past the sealing station. Alternatively or additionally air being blown through the film may cause or assist in causing the passage of the film through the sealing station. Those drive means could comprise a pair of rotatable members that engage and urge the bags to the left when viewed in the drawings. Alternatively the drive means may comprise an operator urging or pulling the film to the left.

With the film so loaded, the sealing station can be activated.

The sealing station comprises a pair of hot wires 44 that run across the width of the film. These are mounted on a pair of posts 46 mounted at either side of the machine such that the wires can move down towards an anvil 48 beneath the film. A plate 50 on which the wires are mounted is urged downwardly by a cam drive which (not shown) is located beneath the film and to one side of the machine. In a revolution of the cam a rod connected to the cam provides a positive drive to bring a plate 52, also mounted on the posts 46, down towards the anvil by a greater distance than the distance shown between the plate 50 and the anvil 48 and then back again. The film at the

sealing station can be stationary or moving when the seal is made. A compression spring 54 collapses towards the bottom of that movement to bias the hot wires against the anvil. In the lower position the hot wires form two spaced seals 58 across the film. At the same time a series of spikes 56 on the anvil form a series of perforations 60 across the film between the seals 58, as shown in Figure 4.

The plate 50 is caused to return up, away from the anvil by brackets 62 at each side that rest on top of the plate 62 and are connected to the plate 50 at their lower end. Thus, during compression of the spring the upper end of the bracket is able to remain stationary during the lower part of the downwards movement of the plate 52 but is caused to raise the plate 50 when the plate 52 engages the upper end of the brackets 62 again.

A fan 64 mounted to the right of the cartridge blows air down, through the cartridge in the direction shown by arrows 66. The air travels through the circular right hand end of the hollow adaptor and then through the lozenge 68 shaped part of the adaptor. The lozenge 68 also assists in spreading the film out.

In one embodiment (not shown) the cartridge is retained at its left hand end, for instance by the disc 16 being held in a semi-circular recess such that it can not move to the left. Prior to that fitting, the nozzle can be made fast with the left hand end of the nozzle within the cylinder of the cartridge with a bayonet fitting. This will assist in preventing the cartridge from being urged into and jamming between the rollers 36 and 38. The semi-circular

recess may be able to be moved against a spring to allow the nozzle to be moved to the right and then sprung back towards the rollers. The semi-circular recess may abut against a stop to prevent the nozzle from being able to be jammed between the rollers. The tube 24 may extend further into the cartridge than is shown in the drawings to provide extra support such as the sole support for the cartridge. Alternatively, a tube may extend all of the way through the cartridge and the adapter may be attached to or be connected to or integral with the tube.

At least one and preferably both of each of the rollers 36 and 38 may be driven. The rollers 36 are arranged to drive the film at a slightly slower speed than the rollers 38. This ensures that the film comes off the cartridge with a small degree of tension in the extent between the rollers. Some slippage of the film between the rollers and the adaptor may occur to allow for this differential drive.

In an alternative embodiment (not shown), the forward end of the cartridge is supported on a brush or between an upper and lower brush and the rollers 36 and 38 may be omitted. The brushes may provide or assist in providing support for the end of the cassette. The brushes may also provide a check on the ease at which the film can leave the cartridge. In this embodiment the film may be pulled through the sealing station by an operator located downstream of the sealing station. The operator can pull as much or as little film past the sealing station before effecting the next seal. In addition, by altering the angle of the extent of the plastic from the sealing station the volume of air in the bag can be varied. For

instance, if the film comes straight out of the station, in line with the axis of the tube, a relatively full bag can be made. If that angle to the axis is increased by bending the bag about to be formed then a less full bag is made. Other means may be used to vary the amount of air in a given length of bag such as by an operator squeezing the about to be formed bag.

With a seal being present at the end of the film, air from the fan tends to force the walls of the tube of film apart upstream of the seal and in the region of the work table 40 and downstream of the supply station, as the film is advanced.

As the wires are brought down again, to form a further pair of seals, air is trapped in the bag between the newly formed seal and the preceding seal. In place of the hot wires, the seal may be effected by applying an impulse of heat, for instance to wires, and allowing the wires to cool whilst the film is trapped between the wires prior to advancing the film.

A wafter board 70, which may be optional, is fast with the plate 50. The board 70 extends across the width of the film and extends downwardly from a pivot mounting 72 towards the adaptor. Consequently, as the plate 50 moves down, the board engage the film partially at an upstream position and then increasing downstream as it is caused to move about the pivot (against the action of a spring, not shown) to waft air between the tube forwardly, past the sealing station, to ensure that the bag formed by the seal is or can if desired adequately filled.

It will be appreciated that the speed of the rollers can be adjusted to control the rate of supply of the film to the sealing station.

It will also be appreciated that the frequency of seals being applied by the sealing station can be altered.

Furthermore, the rate of supply of air can be altered, for instance by varying the speed of the fan.

Any one or more of the air supply, length of film feed (regardless of whether this is manual or automatic such as by the rollers) roller speed or frequency of sealing can be controlled automatically for instance by a control (not shown). Furthermore the control can alter any one or more of these factors to produce bags of a certain length for a predetermined number, and then bags of a different length or, alternatively or additionally, bags of the same length having a different amount of air or alternatively or additionally bags of different lengths having the same or a different amount of air.

In one mode, the operation of the sealing station may be effected manually, for instance by an operator operating a switch which may be foot operated, to cause seals to be effected by the sealing station.

It will be appreciated that, as the air is being supplied continuously from the air supply means, the space within the tube of film is continuously being filled with air and is not dependent upon a limited supply for each bag. It will also be appreciated that large bags can be provided

which, for instance, could be caused to be partially full to enable a bag to be bent around a corner.

An operator will be able to pack a customised product such as by producing four tight small bags for the base of the product in a box, then four large but floppy bags for the lower corners which bags can be bent around the corners then, with the product being located in the box, two tight bags of intermediate length for each of the four sides, then four large but floppy bags for the upper four corners and finally two medium sized, relatively loosely filled bags for the top. The bags can be sequentially produced by a single operator as the product is being packed.

An operator may also be able to pack products on a work bench with bags being supplied from the machine which is located to the side or beneath the work bench. For instance, the bags could come up through an opening in the bench.

In order to load a cartridge with the tubular film, this could be done automatically. For instance, an end of a tube of film could be pulled over the cartridge to one end. Then driven rollers at that end region could rotate to drive more film onto the cartridge towards that one end. As the film bunches up onto the cartridge the rollers could be advanced from that one end towards the other end for instance by the axes of the rollers being advanced by a caterpillar track mounting arrangement for those rollers. For a 1 m length of cartridge, 50 or 100 m of film may be loaded on to it.

Attention is directed to all papers and documents which are filed concurrently with or previous to this specification in connection with this application and which are open to public inspection with this specification, and the contents of all such papers and documents are incorporated herein by reference.

All of the features disclosed in this specification (including any accompanying claims, abstract and drawings), and/or all of the steps of any method or process so disclosed, may be combined in any combination, except combinations where at least some of such features and/or steps are mutually exclusive.

Each feature disclosed in this specification (including any accompanying claims, abstract and drawings) may be replaced by alternative features serving the same, equivalent or similar purpose, unless expressly stated otherwise. Thus, unless expressly stated otherwise, each feature disclosed is one example only of a generic series of equivalent or similar features.

The invention is not restricted to the details of the foregoing embodiment(s). The invention extends to any novel one, or any novel combination, of the features disclosed in this specification (including any accompanying claims, abstract and drawings), or to any novel one, or any novel combination, of the steps of any method or process so disclosed.

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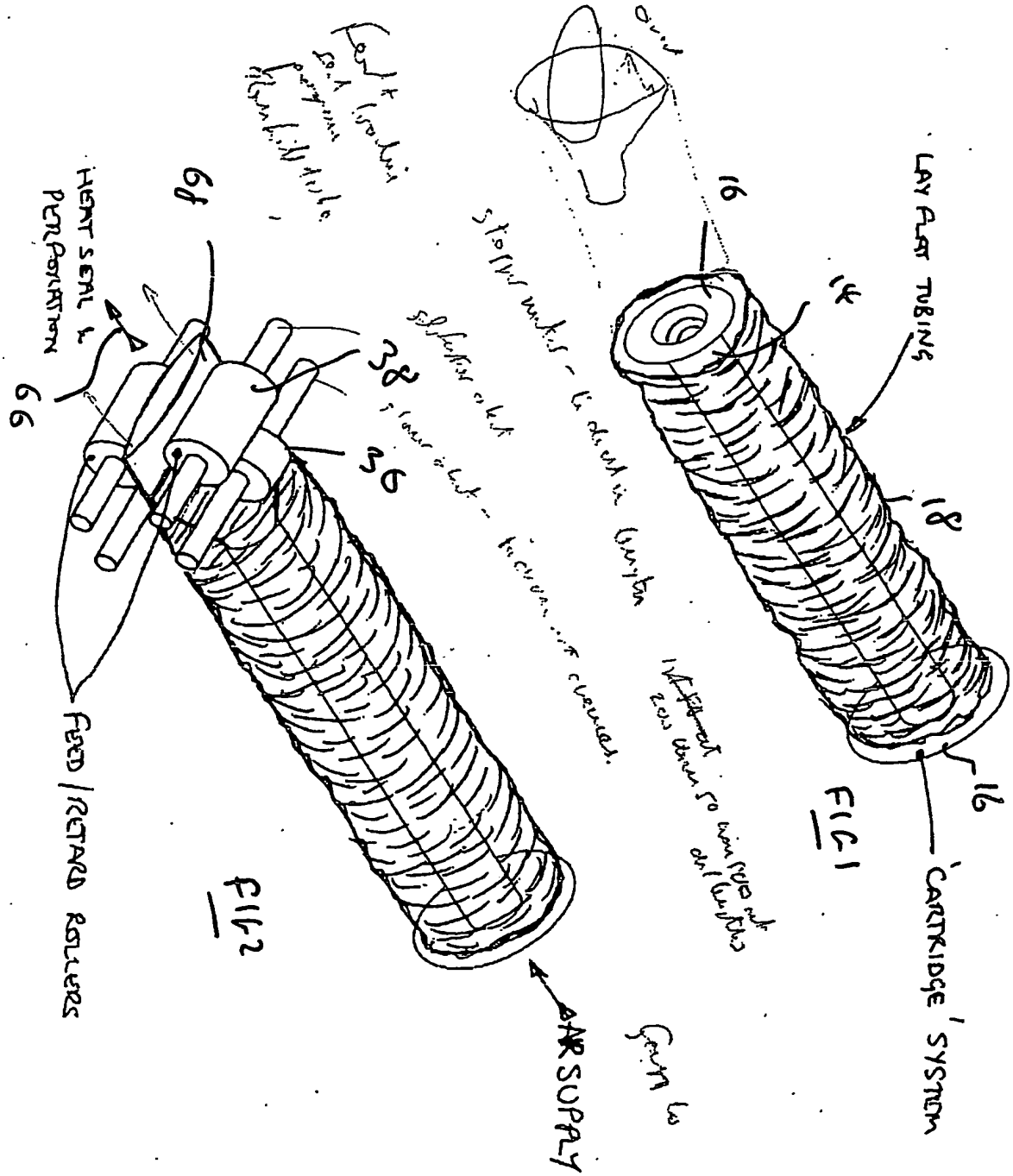

FIG 2

FIG 1

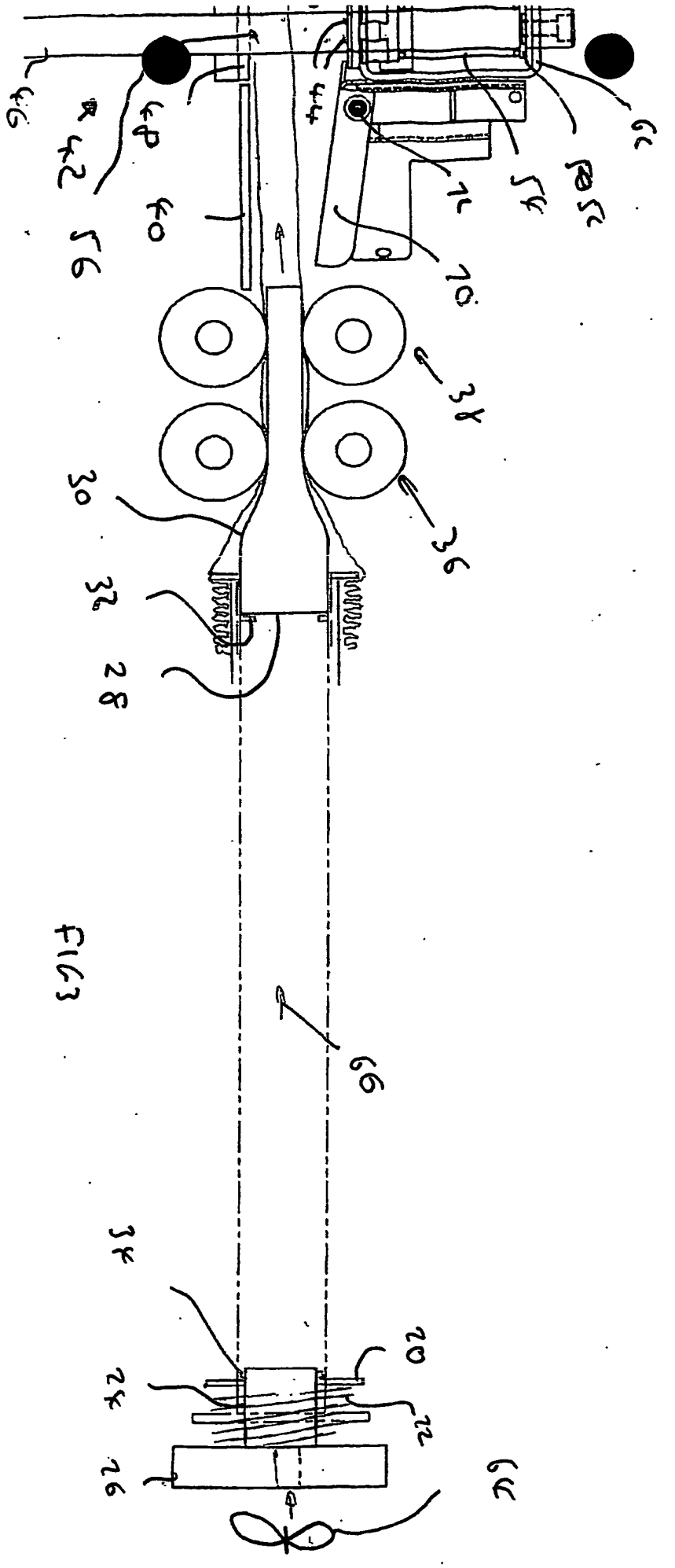

FIG 3

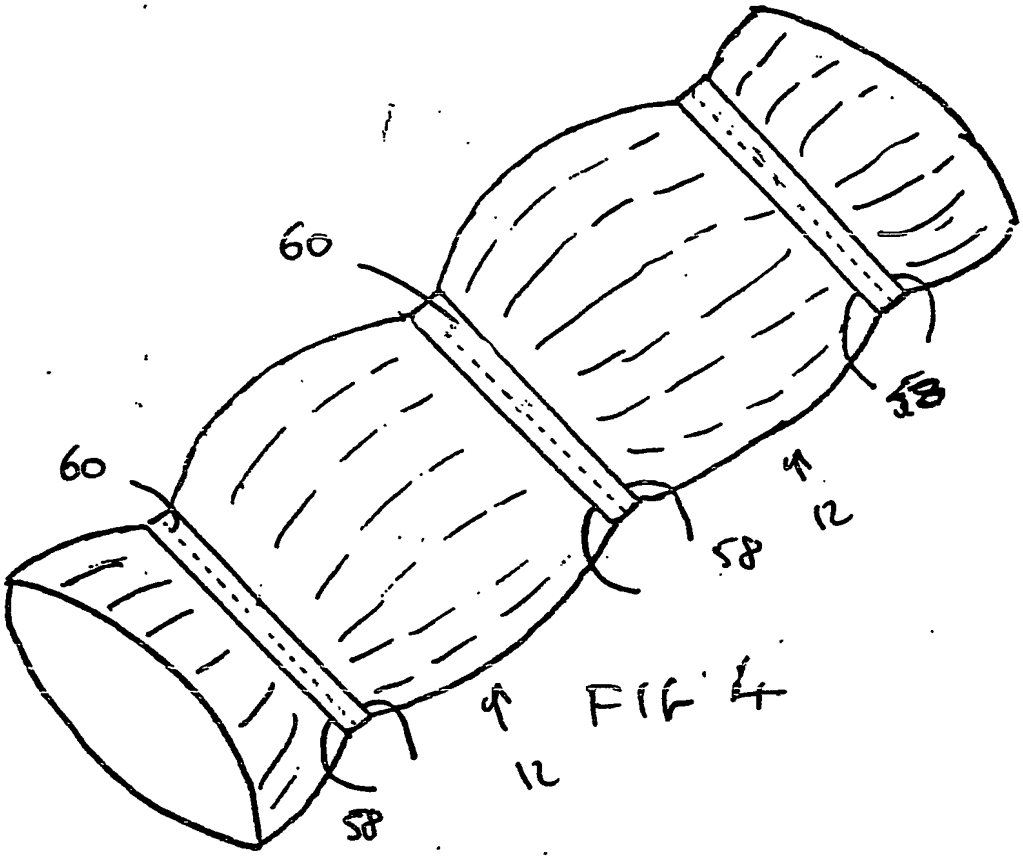

FIG 4